A SYSTEM FOR INVOICING CARS PARKING

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Abstract of **WO9849654**

A system for remote invoicing of cars for utilizing parking sites and toll roads, composed of a device mounted in each car which upon parking the car or entering into a toll road is capable to register the time and date of the beginning and the end of the utilization of the parking space or toll road, at a distant center by utilizing wireless communication means, and be invoiced in real time for the service granted according to various algorithms. Means are also provided to supervise the prompt registration. Other means provide the driver, as a byproduct of the system capabilities, with various services associated mainly with improving his driving and parking environment.

A SYSTEM FOR INVOICING CARS PARKING

Description of **WO9849654**

A SYSTEM FOR INVOICING CARS PARKING
Technical field
The invention relates to a wireless communication system which enables its users to register cars parking at a remote registration center. The system enables to register the entrance to and exit from toll roads and similar road services. Suitable means are provided which enables the control of the prompt registration and the invoicing of the designated payee in accordance with various algorithms and agreements.

Current state of the art
Invoicing for car parking in public parking sites, where entry to and exit from the parking are not monitored, such as street-side parking, is currently performed by means of parking meters which are disposed along the street curb or paper tickets or electronic parking devices which are displayed on the car's
The parking meters are exposed to vandalism, money theft andmcchanical problems. The paper tickets have to be boughtclsewhere and have to be disposed of after being used while the electronic parking cards are activated by magnetic cards which have to be bought or reloaded elsewhere or which transmit the parking data through another transceiving device, while all said electronic devices have to be displayed on the window and turned off manually at the termination of the parking time span.

Cellular telephones are currently being utilized experimentally in association with an electronic display which registers the start and termination of the parking time span at a remotely located registration and invoicing center.

All said devices provide the driver with a limited parking duration which can not be prolonged remotely.

Disclosure of the invention
Aim of the invention
The current invention relates to a system which enables the remote and automatic registration and invoicing of car parking, which is referred to hereinafter also as the system or the parking invoicing system or the parking system.

The invention relates also to the associated methods procedures and algorithms implemented by the various devices which compose the system. Said methods or procedures or algorithms are either integrally incorporated in the devices or are manipulated by the associated software which controls the operating systems of the relevant devices, or are activated by the users and/or operators of the devices.

Due to the inseparable linkage between the manual activities of the system's users and operators and the devices which compose the system, said procedures methods and algorithms become inseparable from the physicaldcvices and together implement the invention.

The system enables also remote automatic or manual registration of the start and termination of a car's parking time span, referred to hereinafter as the parking event. Payment for the parking by a pre-defined payee is either an annual, monthly, weekly, daily, or fractional-time span lump sum, or is automatically invoiced in real time at the termination of the parking event, according to its precise duration and/or any other criterion.

The device hereinafter referred to as the Driver's Device or DD, which activates the measurement of a car's parking duration and the communication with the registration and invoicing center referred hereinafter as the central device or CD and with the inspector's device hereinafter the ID, is located inside the car, preferably permanently, to ensure its ability to terminate every parking event and communicate with the inspectors who control the prompt registration of the start of the parking event in contrast with portable devices which can be forgotten by the driver while outside the car, leaving the driver unable to terminate the parking event upon returning to the car without the device, as well as increasing the difficulties in communication between the inspectors and the DD. The DD does not have to be displayed on the car's window and is not associated with any external device that has to be situated next to the parking bay.

For long range communication, the devices comprised in the system utilize intermediate amplifying transceivers such as is utilized by pagers, cellular telephones etc. Various means make it possible to overcome temporary communication difficulties between the various devices, such as the embodiment which enables the DD to register a pre-programmed number of separate parking events without executing said remote registration. The relevant data pertaining to the parking event is recorded by the DD and transmitted at a later stage to the CD.

The system can also be activated for parking outside the transmitting range provided the DD is transferred physically into the effective range of the intermediate transceivers before the maximal numberof untransmitted parking events' data has been reached.

Means are provided which prevent the execution of an unintentional registration of the parking and an unintentional or impermissible extension of the parking events' duration.

The system also includes means which enable the inspectors of the parking system to monitor, manually or nearly automatically, the registration of the parking of cars belonging to the parking system, and following detection of a parking regulations violation, to compile a parking ticket that can be printed out on a paper form and left on the car, or sent in real time by wireless electronic mailing system directly to the DD.

All data recorded by the inspectors is transmitted in real time or later at the end of the shift, to a device located at a center where the parking tickets are processed by the relevant traffic authority according to local legal regulations and procedures, which device will be referred to hereinafter as the parking control device, or the PCD.

The system also makes it possible to control the inspectors' activities by recording the registration numbers of all parked cars inspected by the inspectors, the times and dates of the inspections and optionally also the location of the parked cars, regardless of whether the inspection resulted a parking ticket or not.

The system includes as an option means which enable to define any telephone, pager or any other communication means as a warning receiving device which receives a warning from the system when the legal parking duration approaches its end.

As a by-product of its capability to transmit signals through intermediate amplifying transceiving means, the system is capable of locating the relevant position of the transmitting device with sufficient accuracy to enable automatic invoicing of the payee for the parking in accordance with the relevant parking fee valid at the said parking site, as well as other parameters that also depend on the parked car's relevant location, such as toll roads invoicing, as is hereinafter disclosed.

The system is also capable of locating stolen cars, either directly by the inspectors or automatically when a transmission is received from the DD associated with a car reported as stolen, as hereafter is described in detail.

Definitions and explanations
To enable a clear understanding of the disclosures and descriptions hereinafter, the following definitions and explanation are utilized through out the text.

The term user is synonymous with driver or inspector or operator of a device who is generally also the authorized user and operator of the relevant device. The authorized user is authorized to operate a device and to enter changes into the operating system of a device at various levels of authorization by utilizing codes and/or special devices devoted only to said task.

Changes in the operating methods can be entered by the authorized person after entering suitable said codes or by utilizing said codes in conjunction with specific designated devices which together enable execution of changes either in the software or in the hardware of a device.

References to the driver or the inspector or to the user or to the operator, in single or in plural, mean in general the person who is the authorized user or the authorized operator of the relevant device.

It is clear that in those cases where the operation of a device is not restricted, anyone becomes an authorized user.

References in general to data, or to data elements mean any form of data type such as information, instructions, codes, messages, signals, confirmations andnonconfirmations messages etc., where each data element contains a specific type of data it defined by the number of characters and by suitable codes recognized by the system which alsoinstruct the system how to relate to it
Data elements can be transmitted, received, entered, recorded, retrieved, processed, analyzed, printed, heard, read, scen, sensed,entered, ctc., by the user and the device, in any relevant combination thereof and in any manner which enables the devices and the users to understand the message conveyed by each element and to process each clement of data in accordance with its type and content, and act and activate other devices accordingly.

The term data recording refers to any means of electronic data storing and preserving which makes it possible to process, analyze, transmit, receive, print, read and perform any other data processing activity pertaining to the recorded data in any available form and format and to delete or overwrite any part of said recorded data by authorized persons or means and according to pre-entered procedures available by the prevailing state of the art of data processing.

Wherever applicable and relevant, the words store, record, preserve, register, write are used as synonyms throughout the text in association with data in its extended context, as defined above.

A specific file or a section of the CD which registers all parking events is exclusively devoted, either physically or virtually, to the specific DD. Thus reference throughout the text is made either to the DD or to the section of the central device that is devoted exclusively to that DD or to both simultaneously, without limiting the scope of the appended claims in any way.

Reference is made to various devices in plural or in singular without in any way limiting the scope of the disclosures and theappendcd claims to a specific number of devices or to a specific combination of devices or to a specific system or the pluralitythereof
References to automatic operation of a device mean that once the device is activated by a user or by data received from another device, that device autonomously and automatically performs a set of operations, activities, calculations, etc., in accordance with pre-stored software programs. The execution of automatic operations continues until new instructions or data are entered or received, or the operations are completed.

References to transmission and reception of data, or in brief transceiving of data, include all the procedures which are associated with transmission and reception of all types of data, such as, coordinating and synchronizing the frequencies of the carrier waves at any given point in time, or coordinating and synchronizing the timing and the transmission, reception and decoding of the various codes integrated in the transmitted data.

References in general to the term relevant device in connection with any characteristic of the device, or activity or task performed by the device, mean that the text relates only to the specific type of device or to a specific device within said group which is actually involved in the specific activity or have special characteristics, etc., though not specifying that device or those devices by name.

References in general to a relevant activity in connection with a device or devices, mean that the text relates only to the activity or activities which are actually performed or are associated with the relevant device or the relevant devices, though not specifying that activity or those activities by name.

References to permitted parking duration mean the nominal or maximal duration which the car can be parked in a specific site at a specific date and time. The nominal parking duration is the permitted period which is charged at a regular ratc. The maximal permitted parking duration is the maximal period that a car can park in the same parking place without violating a parking regulation and becoming subject to a parking ticket. The parking duration between the nominal and the maximal duration is preferably charged at an increase fee rate.

Said nominal or maximal duration is defined in respect to a specific zone and a specific date and time and can also be pertaining to a specific DD in accordance with the specific agreement between the payee associated with the DD and the traffic authorities or the parking system's operator.

Methods, procedures and algorithms are referred to, when applicable, also synonymously in association with the system's operation.

Real time is used in connection with the execution of an activity or operation, when the device has been set to perform that activity or operation either immediately or at a later stage at the first occasion it becomes possible to perform it.

Summary of the invention

The parking invoicing system is composed of a network of different types of remotely located devices which communicate during operation directly or through intermediately amplified radio communication systems preferably by utilizing ultra-high wide-band frequencies, including all the associated relevantstatesf-the-art communication procedures such as synchronization of frequencies, coordination of transmission timing and decoding oft;ansmitted data, etc.

One type of said devices, the DD, enables its user, hereinafter the driver, to register the dates, hours and minutes, hereinafter the times, when a continuous parking time span of a specific parked car has been started and terminated, a time span referred to hereinafter as the parking event. In another degenerated embodiment of the DD, it measures only the elapsed time from the start to the termination of the parking event without relating to the actual time and date.

Contrary to existing monitoring systems which control entry to and exit from parking sites, registration of the start and termination of the parking event is performed generally after the driver parks his car and before he drives away from the parking site, respectively, either manually by the driver or automatically by the DD.

Each car is temporarily or permanently associated with a specific DD, as is hereinafter disclosed.

To enforce prompt registration of the start of the parking event, each parking zone is monitored by an inspector or inspectors carrying the second type of device, the Inspector's Device, referred hare in after as the ID, which enables the inspector toquerv any specific DD associated with a parked car, from outside the car also without visual contact with that DD, and learn whether the start of the current parking event of the specific parked car associated with the specific queried DD has been properly registered.

When the ID detects that a parking regulation violation has been committed by the parked car, the entity defined as the payee of the parking fee is issued with a parking ticket for the violation of the parking regulation.

In one embodiment, when the start or termination of a parking event is registered manually or automatically, the DD automatically records and transmits the data pertaining to the parking event to the third type of device which isremotely located at the registration and invoicing center. This device is referred hereinafter as the Central Device or the CD, and is substantially a computer based device with peripheral devices that serve a large number of DDs simultaneously. The CD receives, checks, analyzes, confirms, processes and records the relevant received and processed data.

When immediate transmission to the CD is not feasible, the recorded data is queued by the DD for transmission to the CD when the transceiving of data is enabled.

All the procedures which follow manually or automatically triggered registration of a parking event are performed automatically by the devices comprising the system, allowing the driver to leave the car immediately after manually initiating the automatic registration or immediately after parking his car which automatically triggers the automatic registration into action.

The CD calculates the relevant parking invoice in accordance with the measured parking duration, or any other criterion as described hereinafter, utilizing pre-defined time units and various calculating algorithms.

The CD invoices the entity defined as the payee for the calculated parking fee, in accordance with the commercial agreement with him, utilizing the services of automatic invoicing systems such as, for example, those provided by credit card companies.

The CD stores the parking events' data in aspecific, real or virtual file or directory, which is allocated to its

specific DD, utilizing any method available bystatesf-the-art of computerized data storing and processing. Said data storage is referred to hereinafter as the section of the CD specifically associated with a specific DD, or briefly as said section of the CD or only as said section.

In places where local regulations make it compulsory to leave a printed parking ticket on a parked car, the inspector prints out the ticket on a paper form, using a portable key board and a portable printer hooked up with the ID, and leaves it on the parked car. When a printed parking ticket is not compulsory, the inspector sends the ticket's data in real time through an electronic mailing system to aredefined electronic address or directly to the DD. This data is also transmitted either in real time or at the end of the shift, by radio or regular telephone line or a direct connection, to a computer based device operated by the traffic authorities, the Parking Control Device, referred to hereinafter as the
PCD. The PCD processes the ticket according to local regulations.

As has been mentioned briefly, communication between the remotely located devices' types is performed by intermediate radio amplifying transceiving devices that are either autonomous to the parking system or simultaneously serve other communication systems such as cellular telephones or pagers.

In another embodiment, the devices comprised in the parking system transceive data at a lower priority than other users of thetranscciving system, an option that reduces the cost of services provided to the parking system by the intermediate transceiving system. Suitable codes and means are incorporated in the transmitted data to make said discrimination possible.

The mutual transmission between the devices comprising the parking system is therefore subjected to the host transceiving system's operating and transceiving procedures and to the transmission priorities allocated to the parking system by the host transceiving system.

In another embodiment the proximity of the DD and the ID during queries enables the two to communicate via direct radio communication exclusively . The direct capability makes it possible to avoid communication difficulties between the transmitting devices and the intermediate amplifying devices.

The radio communication between the ID and the DD makes it possible to install the DD out of sight anywhere in the car, as long as the driver has easy access to the input and output means which enable communication between the driver and the DD and as long as the transmission and reception of data between the external devices and the DD is not interfered by the car's metallic body.

Briefdescnntion of the drawings
Drawing 1 displays a basic block diagram of the DD
Drawing 2 displays a basic block diagram of the ID
Detailed description of preferred embodiments of the invention
The parking monitoring system which is the subject of this invention, is composed of a network of DDs operated by the relevant drivers. The DD is the main communication link between the driver and the other device types which comprise the system.

In a preferred embodiment, the DD is a fixed device which is installed permanently in the car with all of its autonomous operating and transceiving sub-systems, to ensure that the DD will always be available to terminate the parking event at the desired point in time and enable communication with the inspectors during the driver's absence from the car. The DD which is permanently installed in the car also makes it possible to perform various automatic operations in the driver's absence, as are hereinafter disclosed.

Another embodiment, which provides fully automatic registration of the start and termination of a parking event, is adapted chiefly to a DD installed permanently in the car.

The DD comprises also a controller, data processor and a data storing device enclosed within a protective casing. The casing supports input and output devices and components in the form of push buttons, display panel, light emitting devices, sonic signals generator, loud speaker, microphone, mechanical vibration generator etc., or any combination thereof, which enable mutual communication between the DD and the driver.

In a further embodiment of the DD the driver is able to scroll the recorded data or a pointer up and down the display panel by pressing or touching specific push buttons, while the desired displayed data is entered into the DD by pressing or touching another button when the data appears on the panel or is

marked by the pointer.

Another embodiment of the DD enables utilization of various buttons, each dedicated to a specific task and marked to indicate its function.

Another embodiment of the DD enables utilization of a touch screen on which the relevant data may be touched, and yet another embodiment utilizes vocal means to enter data into the DD and hear vocal data that is stored in the DD
Similar relevant input, output and display means are incorporated in the ID and the warning device in any relevant combination thereof.

In general: All the embodiments of the invention incorporate suitable input and output means made available bythe-state-of-the-art which improve and benefit the DD's andID's operation.

To prevent inadvertent activation of the DD or inadvertent data entering into the DD, for example, a driver wishing to activate or enter data into the DD may be required to push the same push button a specified number of times within a given space of time; or alternatively to push a pre-defined combination of buttons that can also be pre-programmed by the driver; or to enter an identifying code.

All these procedures also prevent unauthorized use of the DD. The driver is notified by a signal when he pushes an undefined combination of push buttons or enters any unrecognized and undefined data into the DD.

In another embodiment, the DD enables the driver to switch the operating system to a second language, at least regarding the data displayed to the driver or entered by the driver into the DD. This option is useful in international parking zones which cover neighboring countries with different languages, where a high rate of traffic exchange takes place through open borders, as between member countries in the European Common Market.

The DD can be in several states of operation as follows:
The DD is fully activated in the active state and all the functions provided by it are or can be activated and the parking duration measured as long as it is in the active state.

The DD is partially activated in the passive state, all the functions provided by the DD being available, except for the measurement of the parking duration which is terminated at the transition from the active state to the passive state. Only in the passive state it is possible to register the start of a new parking event.

In the off state only the internal clock included in the operating system of the DD remains active and all the DD's other functions cease operation. This state, which is designed to minimize electric power consumption, deprives the DD of its ability to communicate with other devices. In some embodiment such a that when the DD is also a general data transceiver it is left with the capability to receive and record data also in the off state. When the DD is transferred from the off state directly to the active state it is first shifted to the passive state and from there automatically to the off state.

The DD can also be in a disabled state, ashereinafter defined, simultaneously with each of the states mentioned heretofore.

The DD can also remain in a totally disabled state, as hereinafter defined in detail, when the supply of suitable power to the DD is interrupted.

All the recorded data and the operating software are preserved in any state.

In another embodiment of the DD, when the driver parks his car and turns the motor off the DD is activated automatically to register the start of a parking event, as detailed hereinafter.

In another embodiment of the DD, when the driver starts the car motor or moves the car, the DD is activated automatically to register the termination of the parking event, as is hereinafter detailed.

In further embodiment the registration and the termination of the parking event are both initiated automatically.

After being manually or automatically activated, the DD is shifted into the active state from either the off or passive state, and is immediately triggered to start, automatically and autonomously, the procedures associated with recording and transceiving data regarding the registration of the start of the parking event, utilizing the intermediate transceiving system, or when transmission to the CD is not possible, queuing the relevant data, which includeintcr alia the current date, hour and minute read from the internal clock of the DD's operating system. The transmission includes a code which unequivocally identifies the transmitting DD and another code indicating that the DD has been shifted into the active state.

Other codes and signals, which serve the communicating procedures but are not detailed herein, are also included in the transmission.

If the transmitting DD is associated permanently with only a single specific car and accordingly is enabled to register only the parking events of said single specific car, it is sufficient to transmit only the identity code of the DD.Othenvise the car's registration number or another number which together with the identity code of the DD identifies unequivocally the specific car, has to be entered manually and transmitted to the CD.

In a preferred embodiment, the identity code of the DD can not be altered.

In another embodiment the identity code of the DD can be altered by an authorized person and/or device, in association with anidcntical change in the data base within the CD.

In another embodiment, the driver is enabled to find the relevant location of the parked car with adequate accuracy, and enter manually a code which unequivocally indicates that location to the CD, and without which the driver can not trigger the DD to initiate the registration of the parking event and the automatic, autonomous and immediate transmission from the DD to the CD of the data pertaining to registration of the start of the parking event.

In another embodiment, the parking system contains a geographical positioning capability, enabling it to detect the relevant location of the car automatically and with adequate accuracy and enters said location automatically into the CD and the ID,thcreby providing complementary data pertaining to the start of any parking event transmitted from the DD to the CD.

In another embodiment, data related to the ear's location, such as permitted parking duration and rates, is also automatically transmitted to the relevant devices.

To safeguard the driver's privacy, the driver can disable the system's capability of detecting the transmitting DD's relevant location and nevertheless register the start of a new parking event without disclosing the car's location. In such cases, the payee is preferably invoiced at an increased parking fee rate as compared to the parking fee which is invoiced when the relevant location of the transmitting DD is known to the CD.

When the majority of the cars in a specific parking zone are included in the parking system, detection/registration of cars' parking locations enables the CD to locate and identify automatically sub-zones within said parking zone that are not fully occupied by parked cars and to inform drivers accordingly when requested by the relevant DD. The accuracy of this information depends on the accuracy of the position detection and the proportion between the number of the cars included in the position detecting system and the total number of cars at said parking zone. The data regarding vacant parking sites can also be transmitted to th software, as available by thestateof-the-art of data transceiving and processing, to check and verify that the transmitted data has been fully and correctly received.

After the CD verifies the complete and correct reception of the data and checks and verifies that the transmitting DD is not an invalid device, as described hereinafter in detail, the section of the CD associated with the specific transmitting DD is also shifted automatically into the active state and the CD begins measuring the parking duration of the current parking event, in accordance with the transmitted time and date. The measurement will continue until the time and the date when the DD is shifted either to the passive state or to the off state or the DD is totally disabled and the data relevant to the change of state is received by the CD.

After the CD has checked and verified a complete and correct reception of the transmitted data, it

transmits back to the DD a confirming signal which informs the DD that the transmitted data has been fully and correctly received.

On the other hand, when the CD detects incomplete or incorrect reception of a transmitted data element or part thereof, a specific signal is transmitted from the CD to the DD, informing the DD that the transmitted data has not been completely and/or correctly received.

When the DD receives said non-confirmation signal from the CD or when said confirming signal from the CD is not received by the DD within a pre-programmed time span from the end of the last transmission, the DD automatically retransmits the relevant data.

When said confirmation signal is ultimately received by the DD the repeated transmission to the CD is stopped automatically by the DD.

Repeated transmission of data from a specificDD with relation to a specific parking event after the relevant confirming signal has been transmitted by the CD, indicates to the CD that the confirming signal relevant to said specific parking event was not received by the DD, whereupon the CD retransmits the confirming signal after each repeated receptions.

Any repeated transmission between any two devices is flagged as such with a suitable code, enabling the devices to distinguish between first transmissions of data and repeat transmissions of the same data and to react accordingly.

The received, processed and transmitted data is recorded by the CD on a peripheral data storing device which saves the data independently of future power supply, and after power is restored enables data retrieval in any manner available by the state-of-the-art. As is customary, the CD is also connected to an uninterrupted power supply device which ensures its non stop operation.

All the recorded data is unequivocally associated with the identity code of the transmitting device and with the date and time of the parking event's start, and optionally also with the parked ear's location when that data is available, in a manner making it possible to relate pertinent data unequivocally to the specific parking event, the specific DD, the specific car, and the specific payee who pays the parking fee.

The relevant data transceived between the CD and the DD is also recorded by the DD in a manner which saves the data independently of its future power supply.

The driver is able to read any data recorded by the DD, to confirm that he has read the data, and after such confirmation to delete data elements whose erasure is permitted by pre-programmcd procedures associated with the respective data types.

Said relevant driver's confirmations are transmitted to the CD together with the code identifying a the confirmed data elements.

In another embodiment, the driver is also enabled to utilize the DD or other communication means, after entering suitable authorizing codes, to read the relevant related data recorded in the CD.

As stated earlier, upon confirming that the received data has been completely and correctly received, the CD checks if the transmitting DD is an invalid device, i.e., a device which for example is reported as being stolen, or associated with an unpaid parking invoice or an unpaid fine, etc.

When an invalid DD is detected, the associated section in the CD is disabled from registering new parking events and a specific signal is transmitted from the CD informing the DD that the section in the CD associated with it is disabled from registration of new parking events.

In another embodiment, said signal also disables the DD itself from said capability.

The CD and the DD record the date and time when the DD became disabled.

The driver is informed by a distinct signal generated by the DD, that it has been disabled. Said signal is generated either immediately and repeatedly from the moment the DD became disabled or when the driver registers the start of a new parking event or the termination of the current parking event.

In another embodiment also the reason forth disabling is automatically transmitted to and recorded by the DD, in a manner which enables the driver to read it.

In another embodiment the driver can ascertain if the DD is in the disabled state and the reason for the disabling, by transmitting a specific signal to the CD which in turn transmits back to the DD the requested data.

In the disabled state the DD is deprived only of its capability to be shifted in future from the passive state or the off state into the active state, and to register the start of a new parking event. The capability to register the termination of the current parking event and to transmit and confirm registration of the current and the previously recorded parking events is not impaired in the disabled state.

The DD can therefore be disabled while remaining in the off, passive, or the active states.

The CD re-enables the DD and the section of the CD associated with that DD, to register new parking events, following a suitable instruction entered into the CD either manually by an authorized operator or by another device, such as the computer which handles and manages payment of the parking invoices or the PCD.

Upon each reception of a real-time transmission from the DD which also discloses its location, the CD checks the DD's internal clock and updates it, if necessary, with the local time at the parking zone in which it is positioned.

This option is useful when the car moves from one time zone to another, or when the DD resumes operation after a power supply interruption.

In another embodiment, the DD itself updates its own clock when its location is known.

The DD is limited to registering a pre-programmed maximal number of unconfirmed parking events, after which it is disabled.

In another embodiment, said pre-programmed maximal number can not be altered.

In another embodiment, said pre-programmed maximal number can be altered by an authorized person and/or device, and said change is associated with an identical change in the CD's data base.

Said pre-programmed maximal number may vary from one DD to another according to various commercial agreements between the relevant payee and the parking system's operator, or according to some other parameter.

The driver is informed, either after manually entering a specific request into the DD or automatically when the driver registers a new parking event, as to the number of parking events which can still be registered without confirmation.

The driver is notified by a distinct signal when he shifts the DD into a new state before all the recorded data has been confirmed.

In another embodiment, a periodic signal transmitted from the CD at pre-programmed intervals triggers the DD to transmit the relevant data. Only after receiving this signal does the DD respond by transmitting the relevant recorded and unconfirmed data to the CD. This ensures that the DD will transmit only when communication with the CD is enabled. Said signal is not recorded by any devices.

In another embodiment, when a plurality of CDs are available, the DD either enables the driver manually to shift the registration of the start of the parking event to a different CD, or automatically shifts itself to a different CD, depending on the transmitting DD's location, the accessibility and availability of communication channels and intermediate transceiving means that serve the different CDs, the time and date of the actual transmission, or any other operational or commercial consideration.

When the DD completes transmission of all the data and receives all related confirmations while in the passive state, it shifts automatically from the passive state into the off state to minimize power

consumption.

After the driver shifts the DD from the active state directly into the off state, the DD first goes into the passive state and in this state it completes the confirmations of the data pertaining to all the recorded and unconfirmed parking events, before it switches automatically into the off state.

To register the termination of a parking event and terminate the measurement of the said parking event's duration, the driver and the system follow the procedures described earlier with regard to the registration of a parking event's start. Upon entering the relevant instructions, the DD switches into the passive state and automatically initiates the pertinent transmission procedures which transmit to the CD the data relevant to the termination of the parking event with all the associated codes. Upon receiving the transmitted data, the CD follows all the verification and confirming procedures as described earlier.

Upon completing said procedures the CD shifts the section associated with the transmitting DD into the passive state and terminates measurement of the specific parking event's duration according to the transmitted times.

The CD calculates the parking duration and invoices the payee for the parking duration in a manner described earlier.
when reception of said terminating message from the DD is delayed due to communication problems, the CD terminates the measurement of the parking duration after a pre-programmed duration, which is preferably equal to the maximal parking duration which is permitted at that time and date at the specific parking zone where the car is parked, or according to any other pre-programmed duration when the permitted parking duration is not known.

When the communication is resumed, the CD receives the missing data from the DD and adjusts the parking fee in accordance with the actual date and time of the termination of the parking event as recorded by the DD.

In another embodiment, the DD itself contains sensors or is connected to external sensor, capable of detecting automatically that the motor is running and/or the car has moved from the parking site for a pre-programmed distance or duration, and/or of detecting the opening of the drivers door and the presence of the driver in the drivers seat within a pre-programmed time thereafter,etc., and which signal the DD to terminate the parking event automatically, as described earlier, when one or any combination of these states are detected.

Said sensors are any of the following: a sensor which senses and identifies the absence or existence of vibrations created by the moving car and the running motor or a device which measures the speedometer's output in a manner making it possible to calculate also the distance traveled by the car at any time interval or the system which monitors the operation of the car or a pressure sensor or proximity sensor which senses the presence of the driver in his seat, or a device which indicates when the driver's door is opened, operating in conjunction with data from the pressure or the proximity sensor which indicates that the driver is also sitting in his seat or any other internal or external devices and systems which capable of detecting and unequivocally identifying the termination of the parking event.

According to the data received from said sensors and/or devices, the DD shifts automatically from the active state into the passive state or the off state or vice versa and initiates accordingly the registration of the termination or start of the parking event, as described before. The DD is enabled also in the off state, to receive a triggering signal from said sensors or devices and react accordingly.

In another embodiment, a distinct periodic signal is generated by the DD, alerting the driver to shift the DD manually into the passive state or the off state and register the termination of the parking event, as described before.

The signal is generated periodically as long as the DD remains in the active state and is terminated upon the execution of said change in state.

In general when the driver confirms having noticed a signal generated by the DD, the signal is turned off and the relevant associated code which indicates the confirmation and the time and date thereof is transmitted to the CD.

Said automatic change of state is registered by the DD and is transmitted to the CD in a manner as described earlier.

The fully automatic registration of the start and the termination of parking events is most suitable for users who prefer to be invoiced on a basis of an annual, monthly, weekly, daily, etc. with a lump sum payment irrespective of actual number and/or duration of parking events, such as drivers who park intensively and repeatedly in public parking sites.

In another embodiment, all the automatically registered parking events are registered by the DD and the CD, but the payee is not invoiced for them at times and dates when parking is free and in places where parking is free which make it compulsory that the location of the transmitting DD becomes known to the CD. The driver is enabled to switch from manual registration to the automatic one with or without the association with a lump sum invoicing once he considers it is advantageous to him financially and/or operationally. Said change will prevail for a minimal pre defined time span and an indication for said change has to be transmitted to the CD.

In one embodiment, the driver is enabled to shift the DD manually into the automatic detection-and-registration mode and be associatedwith lump sum payment for the duration of that mode, or to shift back to regular payment for the duration of each individual parking event by entering the appropriate code into the CD, either via the DD, or by a regular telephone line, or by another computer modem, or by any other available communication means which informs the CD accordingly.

Transmission of the data regarding said change can be postponed in a manner as described before, as long as the ID is able to detect the prompt registration.

In another embodiment, the DD performs the above shifts automatically upon receipt of appropriate signals from an external device, as for example when crossing specific points at the entrance to a city.

The DDs utilized in automatic registration of parking events and lump-sum payment remain subject to all parking regulations such as a limited parking duration, just as are regular DDs which are invoiced according to the duration of each parking event.

In another embodiment, the DD is down-graded to a simpler type of device that lacks long range radio communication capability, and is capable of communicating only with the ID through short range radio communication means which are limited to short distances. This occurs when the ID is located next to and outside the car which houses the DD. The purpose of said embodiments of the DD is to provide a cheaper DD configuration as compared to those that utilize long range transceiving means such as utilized by pagers and cellular phones, and to make the capital investment entailed in providing and installing the DD so inexpensively that the DD may economically be provided and installed in the car free of charge to the drivcr/payec, while rctaining most other advantages provided by the various embodiments of the invention which are independent on the communication with the CD.

To pay for the parking, said lump sum payment arrangement may be employed or the driver may register the start and termination of the parking event by utilizing a magnetic or electronic card of a type which enables the DD to charge the payee in accordance with the parking duration, The card is inserted into the DD at the start and termination of the parking event or is left in the DD permanently, enabling it to perform said automatic registration of parking events until it expires whereupon a warning signal will be issued in advance before said expiration occurs.

In another embodiment, the DD communicates with the CD via short-range wireless local loops means.

The communication system connecting the various devices (CD, IDs, DDs, warning devices and PCD) is either an autonomous system devoted exclusively to the parking system or preferably a system that serves the parking system simultaneously with other wireless telephone or pager systems.

The above embodiments make four operation modes available to the driver: (a) fully automatic start and termination of parking event, (b) fully manual start and termination, (c) automatic start and manual termination, (d) manual start and automatic termination.

In general: In all embodiments, the driver can perform any permitted and authorized changes in the system's operation by entering the appropriate code into the CD, either via the DD, or a regular telephone

line, or a computer modem, or anyother ;Ivailable communication means. Transmission of the data regarding said change can be postponed in a manner as described before.

In another embodiment, detection of the car's position is enabled by a specific signal generated either automatically by the DD itself or in response to an instruction transmitted by the CD. By measuring the differences in the arrival times of said periodic signals to the different intermediate amplifying transceiving devices, and by translating said differences into relative distances, the geographical coordinates of the transmitting DD's position can be calculated with sufficient accuracy to enable the system to define the car's location. By superimposing said coordinates on a suitable map, the system and its users are provided also with the approximate street names and block numbers, which are located in the vicinity of the transmitting DD.

In one embodiment, the ID, too, transmits a periodic signal that enables its position to be determined, to facilitate automatic integration in parking tickets, or for statistical purposes.

In one embodiment, at least the CD and optionally the DD as well, automatically record the transmitting DD's position at pre-programmed time intervals, together with the dates and times of said measurements.

The driver can disable andenable the DD's geographical positioning capability or recording of the position data, by entering the appropriate code into the DD or directly to the CD in a manner as described before.

Preferably, the recorded geographical positioning data as well as other relevant data related to the terminated parking event, is deleted manually or automatically only after the system has been informed that the specific parking event of the specific parked car was completed without any parking regulations violation. The fact that no parking violation has been committed becomes known to the system after the knowledge that a specific parking event has been terminated without a parking ticket associated with it having been issued, and the relevant data related to the time span when the parking event took place has been transmitted from the ID to the traffic controlling authority or to the CD, or to both.

In another embodiment, the DD issues a warning signal when the system detects that the car is not located a pre-defined distance from its current parking place after expiration of the permitted parking duration, or has not moved from the current parking place within a pre-defined time. If the signal is ignored by the driver within a pre-dcfined time span and the parking event is not terminated, the entity associated with the car automatically receives a parking ticket for violation of a traffic regulation. The data regarding said parking ticket is transmitted to the said entity by regular mail or by electronic mail and/or the DD receives the data included in the ticket, records it and informs the driver accordingly, in a manner as described heretofore. The driver has to confirm that he saw the data included in the ticket before he is enabled to delete it.

When local regulations require that a printed ticket be printed and left on the parked car, the relevant inspector is informed as to the locations of cars currently violating parking regulations and after detecting the cars, he printed and places the relevant parking tickets on those cars. To enable operation of this embodiment, the transmitting DDhas to be disposed in the car at least during said transmission. The DD is also utilized to compile and print parking tickets for cars not included in the parking system.

In one embodiment the identity of the DD, the location of the parking site, the time and date of the parking event's start and termination, the permitted parking duration at said location and said date and time, the actual parking duration, the DD's cumulative parking fee paid to date, as well as any other relevant parameters are taken into consideration by the system as parameters for activities such as: allowing different permitted parking duration and parking fee to different DDs at different time and dates and at different parking zones, automatic termination of the parking event or automatic issue of a parking ticket, or invoicing different parkingfees at different times and dates, or invoicing different parking fees at different parking zones, or invoicing different DDs for different parking fees, or progressive or regressive invoicing of the parking fee in accordance with the length of the parking duration, or non invoicing of DDs for the parking fees of all or only specific parking events, or any combination thereof.

In another embodiment, the DD and the CD are also enabled to determine the permitted parking duration in the relevant parking zone automatically, on the basis of the parked car's transmitted position, and to inform the driver thereof, either automatically or following a request from the driver.

In another embodiment, extension of the nominal duration of parking event is enabled remotely, either

manually or automatically, when and where such extension is permitted. Extension of a specific parking event's duration beyond the permitted maximal parking duration is prevented, by imposing a wait of a pre-programmcd duration from the end of the last parking event before the DD is able to register the beginning of a new parking event without the car's violating a parking regulation, or by requiring the driver to move the car to another parking site located at a pre- programmed distance from the current parking site, or for a pre-programmed period, or any combination thereof.

In another embodiment, when the termination of the parking event is approaching, the CD transmits a warning message to a device outside the car, referred to hereinafter as the warning device, which may be a pre-defined ordinary telephone or a cellular telephone or a pager, alerting the driver to the approaching termination of the permitted parking time span. The driver has to confirm reception of the data in a manner as described before.

In another embodiment, the driver is enabled to prolong the parking event's duration remotely, when such an extension is permitted, by transmitting said request to the CD or directly to the DD via the warning device, with an associated code, following reception of said warning or before receiving said warning.

The warning device also informs the driver of various events associated with the parking of the relevant car. For example when the car is about to be towed away due to local parking regulations which justify such action, the ID transmits the data either directly to warning device or indirectly via the DD or the CD or PCD which transmits the data to the warning device.

Automatic extension of a parking event's duration is enabled only where and when said extension is permitted, either by enabling the DD to continue measuring the current parking event's duration, or by automatically or manually shifting the DD to the passive state and back to the active state.

In another embodiment, after the DD has remained in the active state longer than a pre-programmed duration beyond which parking is not permitted, a distinct periodic signal is generated by the DD, alerting the driver to shift the DD manually to the passive state or to the off state.

In another embodiment, when the driver switches the ignition off or the DD receives other indications from external sensor as described before, a distinct periodic signal is generated by the DD, alerting the driver to shift the DD manually to the active state.

In another embodiment, the DD is shifted automatically to the passive state or to the off state at the end of the permitted parking duration.

In another embodiment, safety means prevent entering of data into the DD when the car is moving or the motor is running.

In another embodiment, safety means ensure that the driver will not receive any form of visual data from the DD when the car is moving or the motor is running.

In all embodiments of the invention: each specific car is associated with at least one specific DD and vice versa, by associating the relevant identification number of the specific DD with the car's registration number or with the number of a numbered sticker placed on the windshield, or with both numbers. Said association is performed when the DD is manufactured or purchased or installed.

Preferably The DD's identification number cannot be altered after it was entered into the DD.

Optionally said number can be changed by an authorized parson and device in association with a similar change in the CD and the System's data bases.

Only the associated DD can register a legal parking event for its associated car.

Each of a plurality of specific cars can be associated with a single specific DD by associating that DD's identification number with that car's registration number or with the aforesaid sticker number, or with both numbers. when a driver starts a parking event, said code or number which unequivocally identifies the specific parked car is entered manually into the DD and transmitted automatically together with the DD's identity number and other relevant data.

Each of a plurality of specific DDs can be associated with a single specific car by associating thecar's registration number or said sticker number with the specific DD's identification number, as described above. When the driver starts a parking event, said codes or numbers which unequivocally identify the specific parked car and the specific DD are transmitted automatically with the other relevant data.

Each of a plurality of cars can be associated with each of a plurality of DDs, by associating the car's registration number or said sticker number, or both, with the specific DD's identification number. when a driver starts a parking event, said code or number which unequivocally identifies the specific parked car is entered manually by the driver and is transmitted with the relevant code which identifies the specific associated DDs. Each of the DDs becomes permanently associated with said car or only temporarily during a specific parking event.

In all the embodiments, power is supplied totb: DD preferably also from the car's battery. The power supply is backed up by a rechargeable internal battery which is recharged from the car's battery.

The DD operates preferably on low voltage, such as 3.0 volts, which ensures that even a car battery too weak to start the car, still enables the DD to operate.

The driver is alerted by a distinct signal when the power source's output voltage drops to a pre-set level which is higher than the level at which the DD becomes totally disabled. At saidpro-set voltagelevel, the DD shifts automatically into the passive state. A suitable code as well as the date, hour and minute of the shift into the new state is recorded by the DD and transmitted to the CD, which records and confirms reception of said data in a mannerdescribed earlier.

When the voltage level drops further and before the DD is totally disabled, the DD is shifted automatically from the passive state into the off state and an indication of the change of state is recorded and transmitted in a manner as describedbe.'.bre.

Removal or improper installation of the back-up battery or a voltage drop below a pre-set value, will shift the DD into a total disablement state, also disabling the internal clock if said clock is not provided with autonomous and independent power source as becomes common in new devices, while all data recorded in the DD is preserved unaltered. The time and date of the start of said disablement are recorded in the DD using an emergency power source, such as for example a loaded capacitor or an independent emergency power source, which enables performance of at least said recording before the DD shifts into the total disablement state. Said emergency power source also keeps the internal clock in operation at least for a duration sufficient to replace an out-of-order back up battery.

When power is restored after an interruption in the power supply, the DD is shifted to the passive state to prevent inadvertent invoicing for parking. While in the passive state, when necessary the DD requests and receives the current date, hour and minute from the CD and its internal clock is reactivated accordingly. The DD then transmits thequcued unconfirmed data. Relevant data recorded by the CD during the power stoppage is transmitted to and recorded by the DD. The CD records said date and time when the DD was reactivated.

All the relevant procedures associated with an approaching failure of power supply to the DD and the recovery from such failure, as described before, also apply to the ID.

Failure to utilize the measures aimed at preventing interruption of adequate power supply to the DD, will preferably be reported by the ID as a violation of parking regulations if such an interruption occurs during a parking event. When the DD is totally disabled by an interruption of power during a parking event and is returned to operation later than the end of the permitted parking duration, the associated payee is preferably charged a maximal parking fee for the total parking duration, and will be subject to a fine if the parked car is detected by an inspector with its associated DD not responding because it stays in the total disabled state or in the off state or in the passive state.

After the DD is shifted to the passive state or when the DD is shifted directly to the off state, whereupon it is shifted automatically to the passive state before, it performs all the procedures associated with said change of state, such as completing all the confirmations of parking events with the CD, before being shifted automatically to the off state. A code that the change has been performed is recorded by the DD and transmitted to the CD.

As disclosed briefly heretofore, prompt registration of a parking event's start is overseen by parking inspectors. Each inspector carries a portable ID with associated peripheral devices which enable the inspector to query any DD unequivocally, remotely and without visual contact with the DD, by utilizing radio communication means and to issue a ticket when a parking violation by the associated parked car is detected.

The ID and its peripheral devices are briefly referred to hereinafter also as the ID. Each peripheral device is also referred to individually by its specific name and function in speaking of the specific task which this device performs.

As mentioned briefly before, in someembodim,,nts the cars included in the parking system are identified either by a numbered sticker displayed on the windshield in a manner which enables the inspector to read the number and manually enter it into the ID manually, or by a bar code displayed on said sticker, which can be read by a bar-code reader carried by the inspector or by a magnetic code which can be read through the windshield by a suitable magnetic code reader carried by the inspector or by an optical character reader carried by the inspector and capable of reading the car's registration number or the number displayed on said sticker, or both numbers, or by other means which are available by the state of the art.

As mentioned briefly before, the proximity of the ID to the DD during the query makes feasible an embodiment in which short range direct radio communication is established between the two devices, briefly referred to hereinafter as direct communication or direct transceiving. Direct communication makes it possible to use simpler, cheaper transceivers in the DD and the ID, and to avoid transceiving difficulties which may occur in usingintermediate amplifying transceivers. This embodiment is incorporated for example when the parking agreement between said payee and the parking system operator enables the specific DD to register parking events without transmitting the relevant data to the CD, as for example when automatic parking registration is associated with a lump sum payment which is independent on the parking events' number and duration, during a pre defined time span, or payment per-parking-event with a magnetic or electronic card.

The DD's antenna, must be kept free from electromagnetic shielding, to enable transceiving of data between the DD, the CD and the ID.

The ID is either pre-loaded with current data pertaining to the parking system and updated in real time as changes occur, or depends on the CD for all data relevant to the current queried parking event and parked car.

When and where applicable, in lieu of a response from the DD, the triggering signal generated by the ID activates the CD to transmit the data relevant to the current parking event or to the last recorded parking event pertaining to the specific parked car, which was started or was started and terminated by said associated specific DD.

In one embodiment, the ID transmits a highly directive signal carried by a radiant radio or IR or any suitable Laser beam aimed toward the parked car. Means are provided in the car which unequivocally detect the beam, triggering the DD inside the car to respond by transmitting its identification code and the associated car's identification number or in the absence of said numbered sticker only thecar's registration number, which are displayed on the ID's display panel for comparison by the inspector either manually or automatically, with the data in the ID's data's base, or data in the CD's data base which is read remotely and in real time during the query, by the ID, or any other means available by the state of the art.

The registration number and sticker number are also included in the data transmitted from the associated DD to the ID as a means of checking the validity of the association between the car and the DD or to detect a stolen car when such data is in the system's data bases.

According to the specific method and device utilized, the relevant parked car's and/or the DD's identity numbers are entered manually or automatically into the controller/data processor contained in the ID's operating system.

When said identity number is entered into the ID, it is activated automatically to transmit, either directly or through intermediate amplifying transceiving devices, a radio signal which unequivocally activates the specific DD to disclose the recorded data.

The data transmitted from the DD is compared automatically to the data recorded in the ID or the CD and activates the ID, which reacts automatically or issues a distinct signal instructing the inspector to react manually.

Data can be read by the inspector from a display panel on the ID, and entered by the inspector via a keyboard panel which is included in the ID, in a manner similar to that described before with reference to the DD.

When such data discloses a violation of a parking regulation, such as a car parked with its associated DD not in the active state, or a parking event prolonged beyond the permitted parking duration, or a parking event that has not been registered at all or the location recorded by the DD is different than the car's location in manner which reduced the parking fee, etc., an automatic procedure is triggered, either manually by the inspector or automatically by the ID, which associates the queried data with pre-programmed data stored in the ID, such as the ID's identification number and that of the inspector, with the date, hour and minute of the query as read from the ID operating system's internal clock, and with any other data, such as the parking site's address, that must be included in a legally acceptable parking ticket.

The ID records the composed data on a built-in data recording device as described before with reference to data recording by the DD.

When it is compulsory to leave a printed ticket on the car, the compiled parking ticket is printed on a suitable paper form by a peripheral portable printer and the ticket is left on the parked car by the inspector.

When local regulations permit it, an electronically mailed ticket instead of the printed ticket, which includes all the relevant data included in the parking ticket which is also transmitted to the DD which records the data without need for a printed parking ticket to be left on the car.

An indication that a printed parking ticket has been issued is transmitted to the DD, which records it and alerts the driver with a distinct periodic signal. When electronic mail is utilized, the distinct periodic signal alerts the driver to read the data included in the ticket from the DD once his presence in the car is sensed or the ignition key is turned on. As was mentioned before it is preferred from safety reasons not to display data to the driver once the car starts moving.

In another embodiment the ID is disposed in a car which is driving parallel to the raw of parked car even at the maximal permitted velocity. The ID is facing the parked cars and while being driven it emits preferably a strong, pulscd and highly directive radiant beam, such as radio or IR or any other laser beam, in the direction of the specificnearcst parked car. The DD positioned in said nearest car is provided with detectors which are exposed to the beam and are capable to detect the beam trigger the DD to transmit back the DD's identity number or code and the data recorded by the DD to the ID.

When the transmitted data discloses a violation of a parking regulation the related parking ticket is compiled and transmitted automatically by electronic mail to the relevant DD and when compulsory a printed copy is sent later by the traffic authority once the data is transmitted from the ID to the PCD.

When considering a velocity of 50 kilometers per hour the ID is facing the parked car for about 0.25 seconds which according to the state of the art is sufficient to execute the procedure above. The inspected cars are counted by a device which for example is capable to sense the gape between two parked cars by measuring the duration from the time a pulsed laser beam or ultra sonic beam or radio beam is emitted form the ID until it returns. When the number of responding DDs is not identical to the number of inspected car, walking inspectors are directed to the location of the related parked cars to check and issue a ticket to cars which are violating parking regulation, at the informed locations and which are nor included in the parking system or their associated DD is not responding. of the moving
ID is updated constantly as it moves with the maximal and accuracy and updating rate available by the art.. Means are provided to ensure that only the car which is positioned in front of the moving ID will be queried, by comparing the data related to the cars parked down road which were already queried and after the query with the data related to cars parked up road.

The data pertaining to a parking ticket can be deleted by the driver after confirming that he has read it and the confirmation has been recorded by the DD, or optionally after the data has also beentransmitted to the PCD either directly or through the CD, and confirmed by the relevant receiving device in a manner as

described before.

The ID can also be utilized to print tickets pertaining to violation of parking regulations by cars not belonging to the parking system, by entering the relevant data manually into the said portable keyboard.

Direct communication between the DD and the ID and the capability to register a pre-programmed cumulative number of parking events without the CD's confirmation, enables the driver to register said pre-programmed cumulative number of unconfirmed parking events without being subject to a parking ticket, for example when the DD is outside the effective transceiving range of intermediate amplifying devices or during interruption of communication between the DD and the CD within said effective transceiving range.

Once the number of unconfirmed parking events that have been registered reaches the pre-programmed cumulative number, the DD capability of registering new parking events is disabled, and is re-enabled automatically only after the data has been transmitted to and confirmed by the CD.

The data included in parking tickets is transmitted by the ID to the PCD, either in real time through radio transceiving means or at the end of the inspector's shift via a telephone line or direct connection or a disk, etc.

The PCD stores and processes the data included in the ticket and executes the administrative and legal procedures associated with parking tickets up to the payment of the fine. The PCD checks, confirms and records the received data in a manner as described before in association with the data exchange between the CD and the DD.

The PCD's operation and structure are not described in detail in the present text as its operations are not included in the regular parking invoicing system according to this invention.

The CD and the PCD are linked and exchange any relevant data and instructions, such as an instruction from the PCD to the CD to disable a specific DD due to an unpaid fine. Another example of coordinated activities between the PCD and the CD is when an unjustified parking ticket has been issued because communication between the DD and the ID was not established, in which event said ticket is canceled once the DD transmits the relevant data to the CD which is coordinated with the PCD.

In another embodiment, the CD serves also as a PCD or vice versa.

In another embodiment, the PCD exchanges parking ticket data directly with the DD.

In another embodiment, the relevant data of all parked cars queried by the inspector is recorded by the ID and transmitted to the PCD, which records it in a manner as described before irrespective of whether the query resulted in a parking ticket for illegal parking. The accumulated data recorded by the PCD is utilized by the traffic authority for statistical analysis of car parking patterns and monitoring of the inspectors' performance.

To safeguard the driver's privacy, he may disable, temporarily or permanently, said ID's capability to register and transmit his car's registration number or any other identification number. The ID is capable of overriding said disablement only when a parking regulation violation has been committed by the parked car, in a manner as described before, in order to issue a parking ticket.

When said capability of the ID is disabled by a given driver, that driver's car is included in the inspected car data recorded and transmitted by the ID without its registration or identification numbers.

In order to prevent multiple entries of the same registration or identification number within a pre-programmed time span, the ID stores said numbers in a temporary buffer memory whose contents can not be transmitted or copied but can be compared with the data of new entries within said time span. At the end of the pre-programmed time span, all data contained in the buffer are copied and transmitted without the disabled identification numbers, and only after reception of the transmitted data is confirmed by the receiving device is the buffer emptied.

In one embodiment the DD is triggered by means disposed for example at the entrance and exit from toll roads or public parking to disclosed its identification number or code, in a manner which enables to invoice

the relevant payee for utilizing the toll road or parking adrea in any of the manner described in the text. Means such as a closed loop video photographing are utilized to registercar's registration number when its DD is not responding.

In one embodiment, all communications between the DD and the CD are transceived by the intermediate host transceiving system at a lower priority than other devices not included in the parking system and which are also served by that system. Such lower priority transceiving will in no way interfere with the parking system's operation or reduce its efficiency because the recorded data is preserved in the DD independently of power supply to the DD, and the option of short range direct communication means enables the ID to inspect such data without its having beentransmitted to the CD.

Transmitting at a lower priority may mean transmission at a specific pre-programmed time when the transceiving network is usually less busy or, altematively, at random times when it becomes less busy whereupon a signal is informing the relevant devices to transmit the data waiting for transmission.

*Said embodiment is implemented, for example, by utilizing various codes, timing and frequencies or any combination thereof, to mark, identify and distinguish the data transmitted by the parking system from that transmitted by other users of the transceiving system. Said embodiment enables the entity operating the parking system to pay a reduced rate for the services provided by the intermediate transceiving system.

In another embodiment a plurality of CDsservc the same parking zone, each CD operated by a different commercial operator. Each CD is identified by a specific code which enables unequivocal transceiving of any relevant data between it and any DD. The DD is thus enabled to utilize different CDs, by automatically or manually switching to the transmitting codes, procedures and/or frequencies utilized exclusively by the desired CD, or by switching itself to an exclusive network utilized by the desired CD, or any other method made available by the state of the art, and in any combination thereof.

Data transmitted to a given CD is associated with the identity code of that CD, making it possible at a later stage to direct transmission of any additional data pertaining to a specific parking event to the CD which initially received the data pertaining to registering the start of that parking event.

In another embodiment, the ID can be shifted automatically or manually from short range, direct communication with the DD to long range communication with the DD and other devices via intermediate amplifying means and vice versa, in accordance with the transceiving device and external transceiving conditions.

In another embodiment of the DD and all the software that operates the DD are integrated into a portable or a fixed radio transceiver capable of performing the dual task of a DD and a wireless portable communication device.

In another embodiment of the DD, all components of the DD excepting the input and output means and the transceiving antenna, are integrated physically, electrically and operationally in a single hybrid or VLSI device mounted anywhere in the car, or are totally integrated and merged within the electronic system which controls the car's operation or connecting means are provided in the car during it's manufacturing which enables a plug in connection of the DD to saidcar's electronic control system.

The input and output means which enable communication between the driver and the DD must be mounted in a place clearly visible to the driver and within his easy reach.

In all the embodiments in which the DD provides services beyond the parking invoicing service, only the capability ofregistering the start of new parking events can be disabled by the parking system, while all other services provided by the device continue uninterrupted.

With all the embodiments of the invention, any individual or mutual activity that can be automated is executed automatically by the devices included in the system unless that activity is automatically or manually converted into a manual one by an authorized device, user or operator.

In another embodiment, to keep the car battery from being depleted by repeated transmissions, the DD transmits to the CD only when the car motor is running. In another embodiment, the DD's

communication with the CD while the motor is not running is limited to a pre-programmed number of repeated transmissions of unconfirmed data, after which transmission is automatically terminated.

Transmission is re-initiated when the car motor starts running or the car's ignition is turned on.

In all the embodiments, the relevant procedures and operations that take place between the DD and the CD during data exchange and processing, such as transmitting, repeat transmitting, checking, analysis, confirmation, non-confirmation, recording and any other process that involves data handling, processing and recording etc., also take place with regard to data exchanges with the ID, CD and PCD, in any combination thereof.

In one embodiment of the system each of a device's operations is.flagged with a code that enables it or any other relevant device to distinguish between its self-initiated operations, operations initiated by another device and operations activated manually by its user.

The various embodiments disclosed here before comprise at least a single CD and a single PCD, are serving a plurality of DDs, IDs and warning devices.

In an embodiment of the invention, the system is extended and a plurality of CDs and a single PCD, or vice versa, serve a plurality of DDs, IDs and warning devices in any combination of types of devices.

In another embodiment, the system is extended further and both a plurality of CDs and a plurality of PCDs serve a plurality of DDs, IDs and warning devices in any combination of types of devices.

In another embodiment, a plurality of systems operate simultaneously in the same parking zone, and each CD serves a specific group of DDs during a specific time span, while the PCDs and the IDs preferably share either by sub-zones or according to any specified arrangement in monitoring and registering parking tickets for all the parked cars in said zone.

In another embodiment, a plurality of systems, each serving a specific parking zone, are linked and integrated to operate as a single extended system, wherein the CDs, the PCDs and the relevant intermediate transceiving means are linked in a unified network that enables any DD to register a parking event anywhere in the multi-zone area covered by all the different systems, and any ID to monitor that event.

MEANS OF MANUFACTURING THE INVENTION

With reference to the design and manufacture of the devices and sub-systems comprising the system, according to current state of the art atleast the DD is preferably designed and manufactured as a VLSI device, i.e. a system on chip, or as a hybrid device composed of the minimal necessary number of such VLSI devices, which is currently the only way to mass manufacture and provided The DD economically, free of charge to every driver. With this in mind the disclosures detailed here before are sufficient to enable expert in VLSI devices design, programming and manufacturing, in association with experts in data processing, wireless communication, to design and manufacture an integrated devices and system capable of executing ant combination of the operating methods detailed here before. Further more all parts of the intermediate communication subsystems are either available as existing and operating systems in any major urban area in the developed world and more are installed in a very high rate, while the subsystems incorporated in the devices such as the DD, ID, CD and the PCD are preferably existing blocks which operate in various pagers, cellular telephones etc.

Figure 1 and 2 are examples of basic block diagrams describing the most fundamental functions involved in the operation of the two devices.

Due to the intensive involvement of the human factor in operating the system, and the fact that payments for parking and fines are involved withthc associated temptation to interfere with the DD's software and hardware to prevent transmission of parking data and avoid the associated invoicing, all necessary measures are taken and integrated in the hardware and software to prevent any such interference with the system's operation during regular working. Accordingly, the related claims should be considered with an eye to that aspect and its relation to the system's unique operation, when compared to ordinary data transceiving, processing and invoicing systems which merely transceive data in real time, without for example the temptation for human interference being involved in their operation.

To those familiar with the state of the art, it should be clear from the disclosures here before that only some examples of how to integrate and operate the devices and the system as a whole are disclosed, and within the scope of theappendcd claims the devices and the system may be manufactured, integrated and operatedotherwise than described here before.

A SYSTEM FOR INVOICING CARS PARKING

Claims of **WO9849654**

WHAT IS CLAIMED

1) A parking system and its associated operating methods for registration invoicing and monitoring the registration, of street-side and similar cars parking,, wherein the system comprises at least a plurality of DDs and IDs, and atleast a single PCD, and each DD enables at least manual or automatic registration of a parking event for a specific parked car, and transmitting the data related to the parking event at least to a querying ID by utilizing radio transceiving means, and eachID enables manual or automatic querying of the prompt registration of a parking event for a queried parked car by the relevant DD, by utilizing radio transceiving means even without a visual contact with the queried
DD, and analyzing the queried data and compiling and issuing a parking ticket in real time for a violation of parking regulation by the queried parked car when such violation is detected, and transmit the relevant data included in the ticket to the PCI), and when regulation enables, to transmit the relevant data included in the parking ticket in real time to the DD, or to print a parking ticket on a suitable paper form, and/or transmit an indication to the DD for the issuing of a parking ticket.

2) A parking system and the methods as claimed in claims 1, wherein the system comprises also a remotely located CD in respect to the DDs and the IDs, which is capable at least of invoicing the relevant payee with the related parking fee, either in accordance with parking event's related data transmitted to the CD from the DD, or in accordance with method and/or agreement and/or arrangements as described before, and in any combination thereof, and without the data related to the parking event being transmitted from the DD to the CD.

3) A DD as claimed in claims 1 which enables also registering of the time and date of the start and termination of parking events and relevant related events and activities and the transceiving of data with other devices and automatic and/or manual data entering recording erasure, and disclosure of data to an authorized person or device and automaticsclf activating and other devices activating and manual activating by a person and automatic activating by a device, or any combination thereof.

4) A system and methods as claimed in claims 1 and 2, wherein each specific single device is unequivocally identified by a code, which an not be changed, and enables also unequivocal data transceiving between said device and each specific device of a different type than said device's type.

5) A parking system and methods as claimed in claims 3 and 4, wherein the data transceived between the devices include at least the dates and time of transmission and reception, the transceiving device's identifying code, codes which enable the receiving device to detect missing and incorrectly received data elements or parts thercof, and data elements' identifying codes which instruct the receiving device in processing, recording and erasure of said data elements.

6) A parking system and methods as claimed in claims 1 or 2, wherein a warning receiving device is also provided, which is operating and is operated in a manner as described before.

7) A parking system and methods as claimed in claim 4, wherein the entered data include also codes which enable the device todetect missing or incorrectly entered data elements or parts thereof.

And data elements' identifying codes which instruct the receiving device in processing, recording and erasure of said data elements manner which enables to utilized said codes to detect missing and incorrect data elements, in the received and the entered data.

8) A parking system and methods as claimed in claim 7, wherein after verification of complete and correct data reception, the relevant receiving device automatically transmits a code to the transmitting device, confirming the complete and the correct data reception and after verification of incomplete or incorrect data reception, the relevant receiving device automatically transmits to the transmitting device a code indicating non-confirmation of data reception.

9) A parking system and methods as claimed in claim 3 wherein the transmitting device automatically

retransmits data after its related confirmation code is not received within a pre-programmed time span from the data's previous transmission or after receiving the related non-confirmation code.

10) A parking system and methods as claimed in claim 1 and 2, wherein means are provided which enable the relevant devices to distinguish between initial transmission and reception of data elements and repeated transmissions and receptions of the same data elements, and the receiving device retransmit the relevant reception confirmation after each repeated reception of data elements already previously received and confirmed.

11) A parking system and methods as claimed in claim 3, wherein means are provided which enable vocal data input into a device and disclosure by the device.

12) A parking system and methods as claimed in claims 1 and 3 wherein means are provided which enable the user to enter into a device a confirmation for the disclosure of relevant data by the device.

13) A parking system and methods as claimed in claim I and, 3 or 8 or 12 wherein means are provided which enable erasure and/oroverwriting of relevant recorded data only after said data have been disclosed to the relevant user or transmitted to t'le relevant device and said disclosure or reception has been confirmed by the user or the device, respectively.

14) A parking system and methods as claimed in claim 3, wherein means are provided which preserve recorded data unaltered even during an interruption in the power supply to the device.

15) A parking system and methods as claimed in claim 3, wherein means are provided which enable manual or automatic switching of languages at least in data transceiving, entering and disclosure.

16) A parking system and methods as claimed in claims 1 to 3, wherein means are provided which enable automatic locating of vacant parking places within a specific parking zone, and informing the drivers accordingly.

17) A DD as claimed in claims 1,2 and 8 wherein its capability to register new parking events is automatically disabled after it registers a pre-programmed cumulative number of parking events without said confirmation for their reception by the CD being received by the DD.

18) A parking system and methods as claimed in claim 5 wherein means are provided which a disclose to the driver, either automatically or following his manual request, the number of parking events which can be registered by the DD, before the DD becomes automatically disabled, without the related data being transmitted to the CD and its reception confirmed by the CD,
19) A parking system and methods as claimed in claim 5, wherein said cumulative number can be set differently for different DDs.

20) A parking system and methods as claimed in 1 wherein the IDs and the DDs comprises means which generate a noticeable signal, after an event or before its execution or occurrence, and after each change of state and of operating method, which stays on while the change is taking place or until it is turned of manually by the .driver or automatically by the DD, as described before.

21) A DD as claimed in claims I or 4, wherein means are provided which enables the driver to enter data into it by utilizing his hands, only while the car is not moving.

22) A parking system and methods as claimed in claim 1 wherein means are provided which enable data transceiving between the DD the CD only when thecar's motor is running or the main switch is on.

23) A parking system and methods as claimed in claim 1 wherein means are provided which enable data transceiving between the DD and the CD while the car's motor is not running., only during a pre-programmed cumulative time span, which is terminated when the motor is started.

24) A parking system and methods as claimed in claims I and 2, wherein the DD and ID start to transmit data only after receiving a specific signal from the receiving device.

25) A DD as claimed in claims 1 or 3, which operate as a characters transceiver and as a DD.

26) A DD as claimed in claims 1 or 3 which operate as a voice transceiver and as a DD.

27) A DD as claimed in claims 30 and 31.

28) A parking system and methods as claimed in claims 1 and 4 wherein means are provided which enable the association of a single specific DD or a plurality thereof, with a single specific car or a plurality thereof, permanently, or temporarily during a single parking event or a plurality of such events, or any combination thereof, in a manner which enables only the associated DD to start and terminate at least a single legal parking event for the car associated with it during said parking event.

29) A parking system and methods as claimed in claims 1, 4, or 28, wherein means are provided which enable a specific payee to become associated permanently, or temporarily during a single parking event or during a plurality of such parking events, with a single specific DD or a plurality thereof and with a single specific car or a plurality thereof, or in any combination thereof, and to be invoiced for the parking fees due for parking eventsregistered byend' of said associated DDs.

30) A DD as claimed in claim 1, which is electrically connected to and operationally integrated with the electronic system which controls the car's operations.

31) A DD as claimed in claim 1, which excluding the external transceiving antenna is electrically physically and operationally integrated within theelectronic system which controls the car's operations.

32) A parking system and methods as claimed in claim 1 wherein means are provided which automatically locate the relevant geographical positions of the transmitting DD and/or ID and convey said geographical positions to the relevant devices.

33) A parking system and methods as claimed in any one of claims I or 32, wherein means are provided which disclose the device's geographical position to its user in a manner which enable said user to enter said geographical position into the device and its manual or automatic transmission of. to other relevant devices.

34) A parking system and methods as claimed in claim 32 or 33 wherein means are provided which enable the authorized driver to disable said automatic capability to locate the DD's geographical position and/or the capability to record and transmit the DD's geographical position andenable said capability, either permanently, or temporarily during a single parking event or during a plurality thereof or during a desired time span also without utilizing the DD.

35) A parking system and methods as claimed in . claims1 and 2 wherein data is transceived among the relevant devices via long rang intermediate radio amplifying transceiving system.

36) A parking system and methods as claimed in claims 35 wherein said long rang intermediate radio amplifying transceiving system simultaneously serves the devices comprised in the parking system and devices which are not comprised in the parking system.

37) A parking system and methods as claimed in claim 36, wherein said intermediate radio amplifying transceiving systemtransccives the data among the devices comprised in the parking system at a lower priority than data transceived among the devices not comprised in the parking system.

38) A DD and an ID as claimed in claim 1, wherein the DD utilizes only short-range radio transceiving means for direct datatranscciving with the ID, without utilizing said long rang intermediate radio amplifying transceiving system..

39) A parking system and methods as claimed in claims 1 and 2 wherein the ID and the DD utilizes direct short-range radio transceiving means for direct data transceiving and long rang intermediate radio amplifying transceiving means for data transceiving with devices of other types.

40) A parking system and methods as claimed in claim 35 wherein a plurality of intermediate transceiving systems serve the parking system, in a manner which enables the transceiving devices autonomous automatic coordinated and timed switching from one intermediate radio transceiving system to another one.

41) A parking system and methods as claimed in 1 wherein the DD comprises timer means which measure only the elapsed time from the start of the parking event and terminates said measurements automatically or manually in any of the s manner as described before.

42) A parking system and methods as claimed in claims 1, 2 and 29, wherein the CD invoices the payee associated with a specific parked car and with its associated DD, either according to the parking events' duration as registered and transmitted by said DD to the CD or not according to the registered parking events' duration, and with the datarelated to said duration being transmitted or not being transmitted to the CD, or any combination thereof.

43) A parking system and methods as claimed in 1, 2 and 29 wherein the payee is invoiced for the parking event registered by the associated DD or by the plurality thereof for pre defined time span with a lump sum, regardless of the parking event's duration and/or without the duration of the parking events being transmitted to the CD, as described before.

44) A parking system and methods as claimed in any one of the claims 41 to 43, wherein the DD's identity and/or its geographical position, and/or the date and time of the parking event's start or start and termination, and/or the permitted parking duration at said geographical position during said date and time, and/or the cumulative parking duration during previously pre-programmed time span registered by the DD, and/or the cumulative number of parking events registered by the DD during a previously pre-programmed time span, or any combination thereof, are parameters taken into account by the operating systems of the relevant devices in their automatic self-activation or in activating other devices or in progressive, regressive or linear parking fee invoicing, or any combination thereof.

45) A DD as claimed in claim 1 which is capable to stay in the active state or the passive state or the off state and the disabled state, simultaneously with said states and with said section in the CD which is associated with said DD, and in the total disabled state, and be shifted form each of said states to another state in a manner described before.

46) A parking system and methods as claimed in claims 1 or 45, wherein means are provided which shift the DD from the off state or the passive state to the active state, and initiate the automatic registration of a parking event's start by triggering the DD into automatic transceiving with the CD of the data pertaining to said start, and shift the DD from the active state to the off state or the passive state, and initiate the automatic registration of the termination of the parking event, by triggering the DD into automatic transceiving with the CD of the data pertaining to said termination.

47) A parking system and methods as claimed in claim 46, wherein means are provided which in accordance with the received data, automatically trigger the DD to initiate said registration of the parking event's start.

48) A parking system and methods as claimed in claims 46 or 47, wherein means are provided which in accordance with the received data, automatically trigger the DD to initiate said registration of the parking event's termination.

49) A parking system and methods as claimed in claims 47 or 48, wherein means are provided which automatically switch said automatic triggering capability into manual triggering, one, and vice versa.

50) A parking system and methods as claimed in claims 47 or 48, wherein means are provided which enable manual switching of said automatic triggering capability to manual triggering one , and vice versa.

51) A parking system and methods as claimed in claim 48, wherein said means are activated while the car is parked, or after the car has been driving away from the related parking site for a pre-programmed continuous time span or for a pre-programmed distance, or after the car's motor has been running or the car's main switch has been turned on, during a pre-programmed continuous time span, or any combination thereof.

52) A parking system and methods as claimed in claim 47, wherein said means are automatically activated after the car has not moved or thecar's motor has not been running or the main switch was turnedoft' during a pre-programmcd time span.

53) A parking system and methods as claimed in claims 51 or 52, wherein said means detect the

parking event's start and termination by sensing the presence or the absence of vibration created by the car's motion or by the running motor, or by a human presence in the driver's seat, or by measuring the car's velocity or the distance it has traveled since leaving the related parking site, or by the position of the main switch, or any combination thereof.

54) A parking system and methods as claimed in claims 51 or 52, wherein said means which detect the start and termination of parking events is the electronic system which controls the car's operations and its associated sensors, or external sensors which are physically detached from the car.

55) A parking system and methods as claimed in claims I or 2, wherein means are provided which enable permitted and remote, manual and/or automatic, extension of parking event's duration.

56) A parking system and method as claimed in 1 or 2 wherein means are provided which enable permitted, manual or automatic, extension of parking event's duration.

57) A parking system and methods as claimed inclaimsl or 2, wherein means are provided which automatically and remotely detect the geographical position of a car parked beyond the permitted parking duration, and automatically, remotely and in real time disclose its position and registration number, to the relevant inspectors.

58) A parking system and methods as claimed in claims 1 or 2 or 32 or 33 wherein means are provided which enable the PCD and the CD to receives and records the geographical position of each transmitting ID and DD, respectively, at pre-programmed time intervals.

59) A parking system and methods as claimed in any one of the claims 32 or 33 and any of the claims 46 to48 , wherein means are provided which enable registration of the parking event's start only after the DD's geographical position has been entered to the DD or received by said DD.

60) A parking system and methods as claimed in claim lor 2 and any of the claims 46 to 48, wherein means are provided which enable to initiate the registration of the start of parking events, without receiving and/or entering the DD's geographical position.

61) A parking system and methods as claimed in claims 32 or 33, wherein means are provided which disclose to the relevant device and/or to its user the permitted parking duration in a specific parking zone at a specific date and time.

62) A parking system and methods as claimed in claims 48 wherein means are provided which automatically shift the DD from the active state into the passive or the off state at the termination of the permitted parking duration,.

63) A parking system and methods as claimed in any one of the claims 48 or 60 wherein means are provided which automatically shift the DD and said section of the CD which is associated with the DD, from the active state into the passive state at the termination of the permitted parking duration.

64) A parking system and methods as claimed in claim 1, 2, 46, wherein the system comprises a plurality of CDs and means are provided which enable each DD to register a parking event at any CD among said plurality of CDs.

65) A parking system and methods as claimed in claim 64, wherein the DD transmits all the relevant data pertaining to a specific parking event, only to the specific CD which received and registered the start of said specific parking event.

66) A parking system and methods as claimed in claims 1, 4 and 45 wherein the DD shifts itself periodically and automatically from the off state into the passive state, and while in the passive state it automatically transmits a specific signal which enables the relevant receiving device to identify the DD and its geographical position and/or transmit data to the DD which records said data, and the DD automatically shifts itself back to the off state after receiving a specific confirmation signal for the signal's prompt reception by the relevant receiving device.

67) A DD as claimed in claim 1, wherein a rechargeable battery or a plurality thereof, recharged automatically by thecar's battery, provide the operating power to the DD.

68) A DD as claimed in claims 1 and 45 wherein the DD automatically shifts itself from the active state into the passive state or into the off state when its voltage supply drops to pre-programmed levels.

69) A parking system and methods as claimed in claims 1 or 45, wherein means are provided which automatically totally disable the DD when its voltage drops to a pre-programmed level, andenable the DD back into operation after operating voltage level is restored
70) A parking system and methods as claimed in claims 45, wherein the DD records a specific code at each relevant shifting of state and the date and time when said shifting took place and its reason and the triggering means for said shift, or any combination thereof, and transmits said data to the CD once transmission is enabled.

71) A parking system and methods as claimed in 1 or 2 wherein means are provided which automatically activate the device to resume all its operations, when adequate power supply to the device is restored after a power supply interruption.

72) A parking system and method as claimed in claim 1 and 2 wherein an internal clock is provided within each device's operating system, which keeps record of the current time and date, and the relevant receiving device updates said internal clock with the local time at the place where the transmitting device is located, after each reception of the transmitting device's new geographical position, also when said position is located in a different time zone, and/or after a seasonal time change, and/or after the DD is reactivated following its total disablement.

73) A parking system and method as claimed ir: 72 wherein the driver is also enabled to update manually said internal clock..

74) A parking system and methods as claimed in claims 1, 2, 4 wherein the CD verifies the transmitting DD's validity before starting processing and recording the data received form it and the measurement of the parking event's duration, and disables the section in the CD which is associated with an invalid DD from its capability to register new parking events.

75) A parking system and methods as claimed in claim 1, 2, 4 or 74 wherein the CD checks the DD's validity, and remotely disables also the invalid DD from its capability to register new parking events.

76) A parking system and methods as claimed in 74 or 75 wherein the CD complete all procedures associated with the termination of a specific parking event, even for parking event registered by a DD which has been disabled in the course of said specific parking event.

77) A parking system and methods as claimed in claims 74 or 75, wherein the reason for disablement is disclosed to the driver either automatically or following his manually entered request.

78) A parking system and methods as claimed in claim 1, wherein the car's motor is disabled from starting once the DD is disconnected from its power supply or the DD is removed from the car.

79) A parking system and methods as claimed in claims 1, 4 and 28, wherein means are provided which enable unequivocal identification of cars and their associated DDs, which are comprised in the parking system, also remotely and also while the DD is positioned on a moving vehicle.

80) A parking system and methods as claimed in any one of the claims 1, 4, and 28 wherein the ID enables the inspector, manually or automatically, to unequivocally detect, identify and query a specific DD associated with a parked car.

81) A parking system and methods as claimed in any oneofthe claims 1, 4, 79, 80, wherein the ID is enabled unequivocally and automatically to detect, identify and query a specific DD associated with a parked car in any of the manners described before.

82) A parking system and methods as claimed in any one of claims 1, 2 and 3 wherein the relevant data pertaining to the parking system or at least the relevant changes in said data, are automatically transmitted to the IDs in real time also during a query.

83) A parking system and methods as claimed in claims 1, 4 and any of claims 74 or 79 to 81, wherein the

ID enables the inspector to read from an inquired DD at least its, identification code state and the date and time when it was shifted into said state.

84) A parking system and methods as claimed in claims 1, 2 and 3 wherein theID is enabled to read remotely from the CD the relevant data associated with a queried DD and with the parking system in general, also while querying said DD.

85) A parking system and methods as claimed in any one of the claims 82, 83, 84, wherein the ID enables to compile a parking ticket for a violation of a parking regulation by a parked car, also automatically and in accordance with the data read from the associated DD or from said section in the CD.

86) A parking system and methods as claimed in claim 85 wherein the ID transmits the relevant data included in the parking ticket also automatically and also in real time to a pre-programmed electronic mailing address and/or a specific device and/or the related DD, or any combination thereof.

87) A parking system and methods as claimed in claims 85, wherein the ID enables to print said compiled parking ticket on a paper form in real time.

88) A parking system and methods as claimed in any one of claims 1 and 85 wherein the ID automatically transmits to the DD a code indicating the issuance of a parking ticket, which is recorded and disclosed automatically to the driver by the DD.

89) A parking system and methods as claimed in any one of claims 800r 81, wherein the ID reads, records and transmits to the PCD all the queried parked cars' registration numbers or identification codes or both said numbers and codes, and the date and time of the queries, and the relevant geographical position of the queried parked car, or any combination thereof, in a manner as described before.

90) A parking system and methods as claimed in claim 89, wherein means are provided which enables the authorized driver to disable the IDs temporarily or permanently from their capability to record and transmit said registration number and identification code, in respect to a specific parked car and its associated DD.

91) A parking system and methods as claimed in claim 90, wherein means are provided which enables the inspector to temporarilyre-enable said disabled capability and only to issue a parking ticket for a parking regulation violation by said specific parked car during a parking event registered by its associated DD.

92) A parking system and method as claimed before wherein the ID is driven by a vehicle relative to the queried parked cars and is capable to activate each specific DD positioned in the car parked adjacent to the moving ID and to react to the data transmitted from the DD, or to a non responding DD, in a manner described and claimed before, while the ID is moving relative to the inspected parked car.

93) A parking system and methods as claimed before wherein the ID is mounted on a vehicle mounted on a car moving relative to the inquired parked car and is capable to activate each specific DD positioned in the parked caradjaccnt to the moving ID in a manner as described and claimed before.

94) A parking system and methods as claimed in claims 1 and 2 , wherein the PCD and the CD are physically, operationally and electrically integrated into a single device.

95) A parking system and methods as claimed in claims 1, 2 or 92, wherein the PCD and the CD automatically coordinate relevant data, operations and activities.

96) A parking system and methods as claimed in any one of the claims 1 to 3 and 94 or 95 wherein the ID and the DD automatically deletes relevant recorded data only after all relevant data pertaining to a pre-programmed time span has been transmitted from all the relevant IDs at least to the PCD, and the data's reception by the PCD has been confirmed.

97) ADD , ID , PCD and warning receiving device which are composed, disposed, and operated individually and/or interactively with other devices and their users, in a manner as described and claimed before.

98) A parking system composed and operates in accordance with any combination of devices,

embodiments and their related operating methods as described and claimed before.

99) A plurality of parking systems which are interacting with each other and their operating methods, as described and claimed before.

100) A system for remote invoicing of ears for parking or access to toll roads, the associated monitoring methods and operating and communicating methods and procedures, in any combination thereof, as described and claimed before.